Claims

1.

An (optical) filter comprising
a dielectric stack
of alternating (relatively) high and low refractive index layers,
a dielectric spacer layer,
in juxtaposition with
an opaque, reflective metallic layer or substrate,
the filter having a resonant wavelength,
at which wavelength incident radiation is channelled into,
and absorbed by, the metallic layer or substrate.

2.

An (optical) filter,
as claimed in Claim 1,
in which unique case the dielectric spacer layer
has the same composition and thickness
as one of the constituent layers in the dielectric stack,
and wherein it therefore appears that the stack is in direct juxtaposition
with the metallic layer or substrate.

3. {spatially-variable depth}

An (optical) filter, as claimed in Claim 1 or 2,
wherein the dielectric stack and/or spacer,
varies in thickness spatially,
over the metallic layer or substrate.

4. {circular variability}

An (optical) filter, as claimed in any of the preceding claims, wherein the dielectric stack, and/or spacer, thickness varies circularly over the metallic layer or substrate.

5. {linear variability}

An (optical) filter, as claimed in any of the preceding claims, wherein the dielectric stack, and/or spacer, thickness varies linearly over the metallic layer or substrate.

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6. {tunability}

A monolithic, selectively variable, or tunable-wavelength, narrow-band, absorption (optical) filter, comprising a dielectric stack, and/or spacer, of spatially varying-thickness, deposited upon an absorbent and reflective metallic layer, or substrate, the wavelength absorbed varying with (linear and/or rotational) position of (the stack and/or spacer) filter, in relation to incident light.

7. {stacking sequence - Rule 1}

A single, or multiple wavelength (tunable),
(optical) filter,
including a metallic layer, separated,
by a dielectric spacer layer,
of a low refractive index material,
from a dielectric mirror stack,
comprising alternating layers, respectively of
the same (or similar) low refractive index material,
and a relatively high refractive index material;
a primary resonant wavelength occurring
when the spacer layer is equal to
even integer multiples
of a quarter-wave (optical thickness),
including zero (absentee layer),
and symbolically described as;

Substrate / M nL $(HL)^x$ H /ambient

... where:

M is the metal mirror thin film;

n = 0,2,4,6, etc... ; even integer multiples of the quarter wave optical thickness of the spacer layer; and

H and L represent quarter wave optical thicknesses respectively of the high and low refractive index layers.

8. {stacking sequence - Rule 2}

A single, or multiple wavelength (tunable)
(optical) filter,
including a metallic layer, separated by
a dielectric spacer layer,
of a high refractive index material, from
a dielectric mirror stack,
comprising alternating layers, respectively of
the same (or similar) high refractive index material;
and a relatively low refractive index material;
a primary resonant wavelength occurring
when the spacer layer is equal to
odd integer multiples of quarter-wave (optical thickness),
symbolically described as;

Substrate / M nH $(LH)^x$ / ambient

... where:

M is the metal mirror thin film;

n = 0,1,3,5,7,..., odd integer multiples of the quarter wave optical thickness of the spacer layer; and

H and L represent quarter wave optical thicknesses respectively of the high and low refractive index layers.

9. {stacking sequence / Rule 3}

A single, or multiple wavelength (tunable)
(optical) filter,
including a metallic layer, separated,
by a dielectric spacer layer,
of either high or low refractive index material, from
a dielectric mirror stack,
comprising alternating layers, respectively of
relatively high and low refractive index material;
the spacer layer thickness being
integer multiples of quarter-waves (optical thickness),
and, as this multiple increases,
secondary resonant wavelengths move closer
to the primary resonant wavelength.

10. {stacking sequence}

A single, or multiple wavelength (tunable)
(optical) filter,
with a dielectric reflector comprising
a tiered multi-layer stacking sequence of:

Substrate / M H $(LH)^4$ / ambient

... where H and L equal one quarter-wave optical thicknesses, of relatively high and low refractive index materials, respectively, zinc sulphide and thorium flouride.

11. {alternative stacking sequence}

A single, or multiple (tunable) wavelength (optical) filter,
with a dielectric reflector comprising
a tiered multi-layer stacking sequence of:

Substrate / M HHH $(LH)^4$ / ambient

... where H and L equal one quarter-wave optical thicknesses, of relatively high and low refractive index materials, respectively, zinc sulphide and thorium flouride.

12. {further stacking sequence}

A single, or multiple (tunable) wavelength (optical) filter,
with a dielectric reflector comprising
a tiered multi-layer stacking sequence of:

Substrate / M $(HL)^2$ x$H(LH)^2$ / ambient

... where H and L equal one quarter-wave optical thickness, of relatively high and low refractive index materials, respectively, zinc sulphide and thorium flouride;

'x' is between about 4 through 1000;
for example x = 100.

13. {squared-off performance}

An (optical) filter, as claimed in any of the preceding claims,
incorporating additional dielectric spacers,
configured to steepen the absorption characteristic edge
and so 'square off' filter performance;

14.

An induced absorption (optical) filter,
configured to operate
in the wavelength band 8 to 12μm.

15.

A tunable absorption (optical) filter,
with a spatially varying reflector coating depth,
upon an absorbent layer or substrate,
and configured to operate
in the wavelength band 8 to 12μm.

16.

A tunable (optical) filter,
substantially as hereinbefore described,
with reference to, and as shown in,
the accompanying drawings.

17.

A laser,
incorporating an Induced Absorption Filter (IAF),
at one end of a resonator.

18.

A laser,
incorporating an Induced Absorption Filter (IAF),
at each end of a resonator.

19.

A laser,
substantially as hereinbefore described,
with reference to, and as shown in,
the accompanying drawings.

20.

A tunable or multi-line laser,
incorporating an Induced Absorption Filter (IAF),
at one end of a resonator,
and configured to operate
in the waveband 8 to 12 μm.

21.

A tunable or multi-line laser,
incorporating an Induced Absorption Filter (IAF),
at each end of a resonator,
bounding a lasing medium,
and configured to operate
in the waveband 8 to 12 μm.

22.

A tunable, or multi-line, laser
incorporating a fixed, or variable,
wavelength Induced Absorption Filter (IAF),
as claimed in any of the preceding claims.

23.

A tunable, or multi-line, laser
substantially as hereinbefore described,
with reference to, and as shown in,
the accompanying drawings.

24. {laser resonator}

A laser resonator,
terminated by first and second mirrors,
bounding an intervening lasing medium,
which, upon being energised,
can provide (optical) gain,
at first and second wavelengths;
at least one of the mirrors
having sufficient reflectivity, at the first wavelength,
that laser radiation is generated,
by the resonator,
upon excitation of the gain medium,
whilst being sufficiently absorptive,
at the second wavelength,
that laser radiation is not generated
by the resonator,
upon the same excitation.